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EXECUTIVE SUMMARY

ASSESSMENT OF TOWER CORROSION FOR THE TRANSMISSION LINE REFURBISHMENT PROGRAM

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An assessment of the condition of transmission tower structures in the Central and Western Regions transmission lines which are to be refurbished was made between December 1989 and March 1990. This was done to ascertain what remedial actions might be needed both now and during the new conductor life of 40 - 60 years to ensure adequate structural integrity could be maintained during that time frame. A few towers were examined from a bucket truck and the remainder were surveyed from the air.

Most of the towers examined had previously been painted, probably some 25-35 years ago. With the exception of the Burlington - London line, the painted towers showed only slight evidence of rusting and, although the finish coats had essentially weathered away completely, the primer coat appeared to be almost intact and should still be protecting against corrosion. All towers in the Burlington - London line showed overall rusting of the steel however, the oxide layer seemed dense and tightly adherent and no edge pitting or serious loss of metal was seen.

The main towers in the Niagara, Q23/Q24BM line were galvanized only. General light surface rusting had discoloured the zinc layer but no serious corrosion was evident.

The limited corrosion detected on these towers, some of which are 80 years old, suggests that painting is not required as part of the transmission line refurbishment program at this time. Unfortunately, the lack of historical data on the rate and progression of deterioration of these towers introduces some uncertainty into any predictions of when painting should be undertaken. It is estimated that painting could be deferred for some 10 - 20 years without detriment to their further operational life. Indeed, corrosion may be slow enough, particularly on the towers with intact primer, that a further conductor life from many of the structures may be obtainable without painting.

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32-052-009	833.226	April 17, 1990	90-102-K

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Although it appears from these surveys that corrosion of the tower steel is not a serious concern at present, it must be recognised that the extent and degree of steel corrosion may not have been correctly ascertained due to the general nature of the examinations. It is recommended that selected reference towers from both rural and urban locations in each line be given detailed inspections to accurately ascertain and record their present condition. This close inspection would either verify the general findings or alternatively, enable appropriate remedial measures to be established. It is suggested that this be done first on the Burlington - London line where corrosion appears greatest.

It is further recommended that the data from these detailed inspections be used to form the basis of a formal monitoring program in which the towers would be regularly reinspected, possibly at 5 year intervals, to determine the rate and extent of any further deterioration. This would also allow any need for repair to be identified before serious difficulties could occur.

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ASSESSMENT OF TOWER CORROSION FOR THE TRANSMISSION LINE REFURBISHMENT PROGRAM

General surveys of tower structures in several Central and Western Region lines to be reconductored were made to assess the extent of steel corrosion and determine the maintenance required to obtain a life extension of 40 - 60 years from them. Considering their age, the tower structures surveyed were in good condition with only superficial evidence of corrosion. Some towers that had been painted still had an intact red oxide primer coat even though the finish coat had weathered away almost completely. Overall rusting was evident on the Burlington - London line, however, the oxide layer appeared dense and tightly adherent and pitting or other metal loss was not apparent. Painting does not appear necessary at this time and could be deferred for some 10 - 20 years without leading to future life extension difficulties. For those towers in the Guelph and Niagara lines where the old primer is still intact painting may not be required to maintain their structural integrity for an additional conductor life. A detailed examination of selected towers is recommended to verify these findings and this should be done first on the Burlington - London line. It is also proposed that the data from these examinations be used to form the basis of a monitoring program in which the towers would be regularly re-examined to determine the rate of any further deterioration so that remedial action could be taken at an appropriate time.

The transmission line refurbishment program will involve the installation of new conductors and insulators on several lines in Central and Western Regions. This upgrading will extend the service life of the lines by a further conductor life of some 40 - 60 years. Many of the towers in the

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lines are up to 80 years old and it is necessary to assess whether their structural integrity is adequate for an additional 60 years service or if not, what remedial actions are needed to provide the required life. To gather data on the extent of corrosion on the older structures and establish the need for remedial treatments, aerial surveys of several lines and examination of individual towers from a bucket truck were made.

December 12, 1989 Inspection:

Four towers (MacGuigan 1910) in the Harper Junction to Guelph line were inspected from a bucket truck to assess the degree of corrosion present and determine whether painting or other treatment was necessary at this time. The towers in this line had been painted with what appeared to be a red oxide primer/aluminum finish system which was probably applied more than 25 years ago. Most of the aluminum finish on the four towers inspected had weathered away from the long exposure but the primer was still intact and continued to protect the underlying galvanizing. Small patches of slight surface rusting were visible, most frequently at joints between vertical, diagonal and horizontal members. Even the horizontal sections and the edges of the angles at the top of the towers where contamination and time of wetness can be expected to be greatest showed no significant corrosion.

Aerial surveys of Western Region lines were made by helicopter to gain a general appreciation of the extent of corrosion on the upper portions of the towers and to identify any towers in suspect condition for more detailed additional inspection.

January 8, 1990 Aerial Survey:

Niagara Q23/Q24BM Line:

The main towers in this line are unpainted. The galvanized steel is discoloured by general surface rusting however, no serious corrosion was evident. The degree of rusting near Niagara seemed more extensive than in the rural area but is still not considered to be of concern. Smaller towers near Niagara had been painted with a red oxide/aluminum system. No obvious corrosion could be seen on these towers. The aluminum finish was badly weathered but the primer film appeared to be essentially intact.

Niagara D9H/Q7PG Line:

The towers in this line had been painted with a red oxide primer/black finish system probably some 25 - 35 years ago. Considering the likely age of the coating system it is in excellent condition; much of the finish was still intact and where the finish had disappeared, the primer was in good condition. There has probably been only minimal corrosion of the galvanized steel in these towers.

March 26, 1990 Aerial Survey:

Burlington x Dundas B2/B3, B12/B13 Lines:

Dundas x Brant B12/13W Line:
Brant x Woodstock B2W/B8W Line:
Woodstock x Buchanan W7W/W12W Line:

The extent of corrosion on these lines appeared greater than on the lines previously surveyed. The visual appearance of the tower steel was uniformly rusty with little evidence of any coating remaining. However, the oxide layer seemed to be tight and is probably dense enough to be retarding the rate at which further corrosion can proceed. No edge pitting of the angles or substantial metal loss was evident. There was no obvious difference in condition between any of the towers in these lines; all were considered to exhibit the same degree of corrosion regardless of whether they were in rural or urban locations. It is recommended that selected towers in these lines be closely examined to determine if painting should be planned at this time or whether remedial action can be delayed without incurring future difficulties.

Discussion:

No extensive corrosion of the tower structures other than on the Burlington to London lines was apparent from these general surveys. Even the Burlington to London lines on which overall rusting of the steel was observed showed no evidence of serious loss of metal.

Many of the towers had previously been painted with either a red oxide primer/aluminum finish system or a red oxide primer/black finish system. Both systems had provided surprisingly good performance; the painting must have been done some 25 - 30 years ago as general tower painting ceased in the mid 1960s. Although much of the finish coat had weathered off, the primer appeared essentially intact and should still be providing protection against corrosion.

The limited corrosion detected on these towers, some of which are 80 years old, suggests that painting is not required as part of the transmission line refurbishment program at this time. Unfortunately, the lack of historical data on the rate and progression of deterioration of these towers introduces some uncertainty into any predictions of when painting should be undertaken. It is estimated that painting could be deferred for some 10 - 20 years without detriment to their further operational life. Indeed, corrosion may be slow enough that a further conductor life from many of the structures may be obtainable without painting.

Although it appears from these surveys that corrosion of the tower steel is not a serious concern at present, it must be recognised that the extent and degree of steel corrosion may not have been correctly ascertained due to the general nature of the examinations. It is recommended that selected reference towers from both rural and urban locations in each line be given detailed inspections to accurately ascertain and record their present condition. This close inspection would either verify the general findings or alternatively, enable appropriate remedial measures to be established. It is suggested that this be done first on the Burlington - London line where corrosion appears greatest.

The data from these detailed inspections could form the basis of a formal monitoring program in which the towers should be regularly reinspected, possibly at 5 year intervals, to determine the rate and extent of any further deterioration. This would also allow any need for repair to be identified before serious difficulties could occur.

It may also be useful to paint other towers adjacent to the reference towers with micaceous iron oxide tower finish to provide field data on the coating's performance prior to any general painting need.

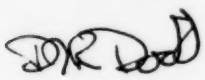
Conclusions:

Considering their age, the tower structures in the lines surveyed were in surprisingly good condition with only superficial evidence of corrosion. Some towers that had been painted still had an essentially intact red oxide primer coat visible even though the finish coat had weathered away almost completely. Overall rusting was evident on the Burlington - London line, however, the oxide layer appeared dense and tightly adherent and pitting or other metal loss was not apparent.

It is considered that general painting to preserve the structures is not necessary at this time and could be deferred for some 10 - 20 years without leading to future life extension difficulties. For those towers in the Guelph and Niagara lines where the old primer is still intact painting may not be required to maintain their structural integrity for an additional conductor life.

The true extent of steel corrosion may not have been correctly ascertained because of the general nature of these surveys and it is recommended that a detailed examination of selected towers be made to verify these findings. This should be done first on the Burlington - London line where corrosion appears greatest. It is also proposed that the data from these detailed examinations be used to form the basis of a formal monitoring program in which the towers would be regularly re-examined, possibly at 5 year intervals, to determine the progress of any further deterioration so that remedial action could be taken at an appropriate time.

Approved by:



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